APRIL/MAY 2024

23PPH22 — QUANTUM MECHANICS - I



Time: Three hours

Maximum: 75 marks

PART A $-(10 \times 2 = 20 \text{ marks})$

Answer ALL questions.

- State Hermitian operator.
- 2. What does uncertainty relation mean?
- Define alpha emission.
- 4. Write down the equation for system of two interacting particle.
- 5. What is mean by coordinate representation?
- 6. Define the term "unitary transformation".
- 7. State stark effect.
- 8. Write down any two applications of Simple Harmonic oscillator.
- 9. Define the term "Ladder operator".
- 10. What is mean by symmetry and antisymmetric of wave function?

PART B — $(5 \times 5 = 25 \text{ marks})$

Answer ALL questions.

11. (a) Derive the expression for time independent Schrodinger equation.

Or

- (b) Write a short note on postulates of Quantum mechanics.
- 12. (a) Explain in details Square well potential barrier.

Or

- (b) Explain rigid rotator.
- 13. (a) Derive an equation of motion in Heisenberg representation.

Or

- (b) Explain in detail about unitary transformation.
- 14. (a) Obtain the expression for stark effect in hydrogen atom.

Or

(b) Give the simple derivation of WKB Quantization.

(a) Derive the matrix for Lx, Ly and Lz.

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Or

Explain Pauli's exclusion principle.

PART C — $(3 \times 10 = 30 \text{ marks})$

Answer any THREE questions.

- 16. Derive the expression for Ehrenfest's theorem.
- 17. Deduce the particle moving in a spherically symmetric potential.
- 18. Derive the equation of motion in Schrodinger representation.
- 19. Apply variation method of ground state energy of the hydrogen atom and obtain the minimum energy.
- 20. Find out the C. G coefficients for $j_1 = j_2 = 1/2$.